AzureWave Technologies, Inc.

AW-CM358

IEEE 802.11a/b/g/n/ac WLAN with Bluetooth 5 Combo LGA Module

Datasheet

Rev. B

DF

(For Standard)

FORM NO.: FR2-015_ A Responsible Department：WBU Expiry Date: Forever
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Features

WLAN

- 1 antennas to support 1(Transmit) × 1(Receive) technology and Bluetooth
- High speed wireless connection up to 433.3Mbps transmit/receive PHY rate using 80MHz bandwidth
- Backward compatibility with legacy 802.11 ac/n/a/g/b technology.
- 20MHz bandwidth/ channel, 40MHz bandwidth/ channel, upper/ lower 20MHz packets in 40MHz channel, 20MHz duplicate legacy packets in 40MHz channel mode operation.
- 80MHz bandwidth/ channel, 4 positions of 20MHz packets in 80MHz channel, upper/ lower 40MHz packets in 80MHz channel, 20MHz quadruplicate legacy packets in 80MHz channel mode operation.
- Dynamic frequency selection (radar detection)

Bluetooth

- Baseband and radio BDR and EDR packet types – 1Mbps (GFSK), 2Mbps (π/4-DQPSK), and 3Mbps (8DPSK).
- Fully qualified Bluetooth BT4.2 and support Bluetooth 5.
- Enhanced Data Rate (EDR) compliant for both 2Mbps and 3Mbps supported.
- High speed UART and PCM for Bluetooth.
- Fully functional Bluetooth baseband-AFH, forward error correction, header error control, access code correlation, CRC, encryption bit stream generation, and whitening.
- Adaptive Frequency Hopping (AFH) using Packet Error Rate (PER).
- SCO/ eSCO links with hardware accelerated audio signal processing and hardware supported PPEC algorithm for speech quality improvement.
- Standard Bluetooth power saving mechanisms.
- Automatic ACL packet type selection.
- Full master and slave piconet support.
- Scatternet support.

- Enhanced radar detection for long and short pulse radar.
- Enhanced AGC scheme for DFS channel.
- 20/40/80Mhz coexistence with middle-packet detection (GI detection) for enhanced CCA.
- 1 spatial stream STBC reception.
- LDPC transmission and reception for both 802.11n and 802.11ac.
- 256 QAM (MCS 8, 9) modulation, optional support for 802.11ac MCS 9 in 20MHz using LDPC.
- Short guard interval.
- Temporal Ley Integrity Protocol (TKIP)/ Wired Equivalent Privacy (WEP)/ Advanced Encryption Standard (AES)/ Counter-Mode/ CBC-MAC Protocol (CCMP).
- Cipher-Based Message Authentication Code (CMAC)/ WLAN Authentication and Privacy Infrastructure (WAPI).
- External Crystal frequency

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- Enhanced Power Control (EPC).
- Channel Quality Driven Data Rate (CQDDR).
- Encryption (AES) support.
- Supports link layer topology to be master and slave (connects up to 16 links).
- LE Privacy 1.2
- LE Secure Connection.
- LE Data Length Extension.
- 2 Mbps LE
- Direction Finding – Connectionless Angle of Departure (AoD).
- Direction Finding – Connection – oriented Angle of Arrival (AoA)

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Revision History

Document NO: R2-2358-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2020/11/13	DCN019305	● Initial Version	JM.Pang	Chihhao Liao
B	2021/04/17	DCN021503	● Datasheet format update	JM.Pang	Chihhao Liao

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1. Introduction

1.1 Product Overview

AzureWave Technologies, Inc. introduces the pioneer of the IEEE 802.11 a/b/g/n/ac WIFI with Bluetooth 5 combo SDIO and UART LGA Module --- **AW-CM358.** The AW-CM358 IEEE 802.11 a/b/g/n/ac WIFI with Bluetooth 5 combo module is a highly integrated wireless local area network (WLAN) solution to let users enjoy the digital content through the latest wireless technology without using the extra cables and cords. It combines with Bluetooth 4.2 and provides a complete 2.4GHz Bluetooth system which is fully compliant to Bluetooth 4.2 and v2.1 that supports EDR of 2Mbps and 3Mbps for data and audio communications. It enables a high performance, cost effective, low power, compact solution that easily fits onto the SDIO and UART combo LGA module. Generic interfaces include SDIO 3.0 and high-speed UART interfaces for connecting WLAN and Bluetooth technologies to the host processor.

AW-CM358 uses Direct Sequence Spread Spectrum (DSSS), Orthogonal Frequency Division Multiplexing (OFDM), BPSK, QPSK, CCK and QAM baseband modulation technologies. A high level of integration and full implementation of the power management functions specified in the IEEE 802.11 standard minimize the system power requirements by using AW-CM358. In addition to the support of **WPA/WPA2** and **WEP** 64-bit and 128-bit encryption, It also supports the **IEEE 802.11i** security standard through the implementation of **Advanced Encryption Standard** (**AES)/Counter Mode CBC-MAC Protocol (CCMP), AES/Galois/Counter Mode Protocol (GCMP),** Wired Equivalent Privacy (**WEP)** with Temporal Key Integrity Protocol (**TKIP)**, Advanced Encryption Standard (**AES**)/Cipher-Based Message Authentication Code (**CMAC**), and WLAN Authentication and Privacy Infrastructure (**WAPI**) security mechanisms. For video, voice, and multimedia applications, 802.11e Quality of Service (QoS) is supported. The device also supports 802.11h Dynamic Frequency Selection (DFS) for detecting radar pulses when operating in the 5 GHz range.

Wireless home audio and video entertainment systems including DVT, set-top boxes, blue-ray DVD players, media servers, and gaming consoles. Mobile routers and Internet of Things (IoT) gateways. AW-CM358 module adopts NXP's latest highly-integrated WLAN & Bluetooth SoC---**88W8987**. All the other components are implemented by all means to reach the mechanical specification required.

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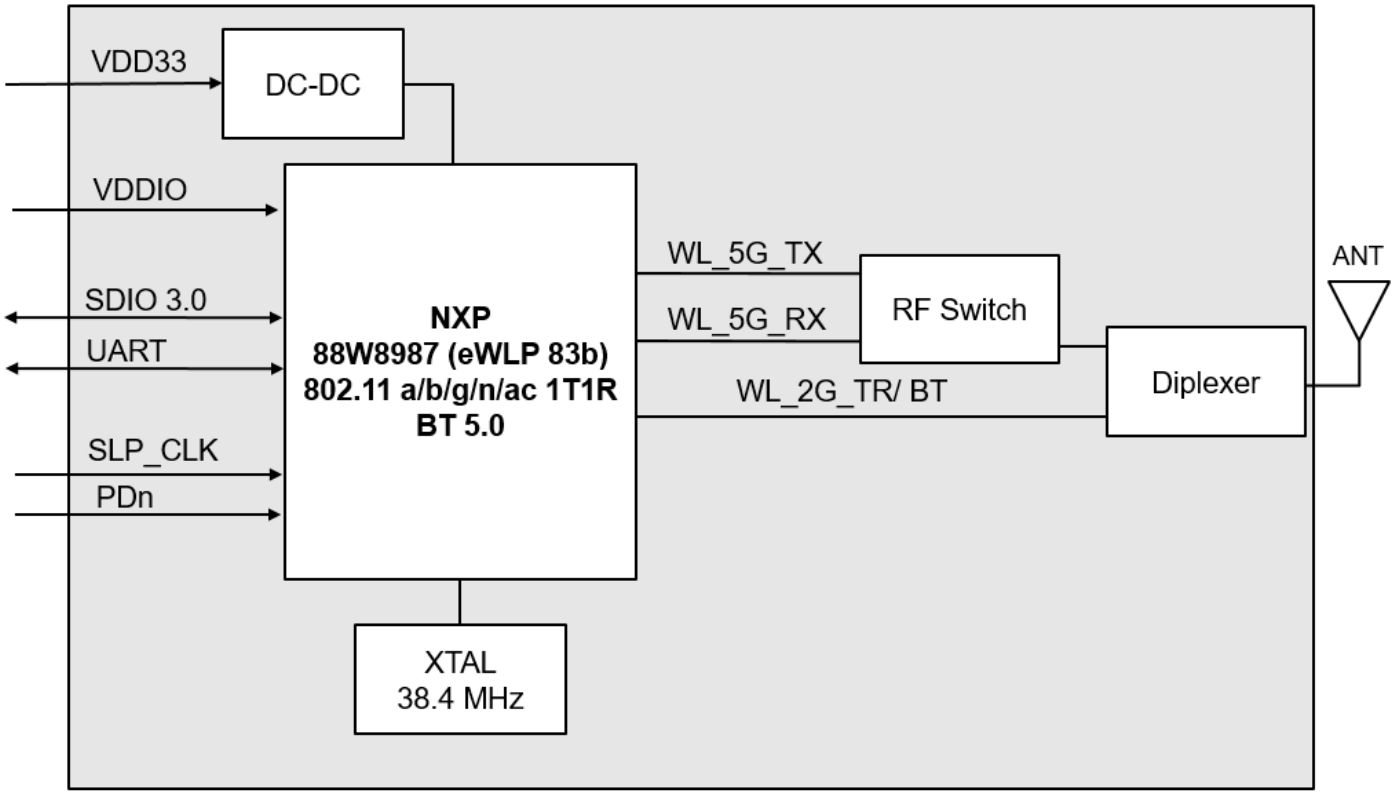
1.2 Block Diagram



AW-CM358 BLOCK DIAGRAM

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1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 a/b/g/n/ac Wi-Fi with Bluetooth 5 combo LGA module
Major Chipset	NXP 88W8987
Host Interface	WiFi + BT ● SDIO + UART
Dimension	12 mm X 12mm x 1.65 mm (Tolerance remarked in mechanical drawing)
Package	LGA module, 47 pins
Antenna	1T1R, external
Weight	0.5 g

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE802.11 a/b/g/n/ac
WLAN VID/PID	N/A
WLAN SVID/SPID	N/A
Frequency Rage	2.4 GHz ISM Bands 2.412-2.472 GHz 5.15-5.25 GHz (FCC UNII-low band) for US/Canada and Europe 5.25-5.35 GHz (FCC UNII-middle band) for US/Canada and Europe 5.47-5.725 GHz for Europe 5.725-5.825 GHz (FCC UNII-high band) for US/Canada
Modulation	802.11a/g/n/ac: OFDM 802.11b: CCK(11, 5.5Mbps), DQPSK(2Mbps), BPSK(1Mbps)
Number of Channels	802.11b: USA, Canada and Taiwan – 1 ~ 11 Most European Countries – 1 ~ 13 802.11g: USA and Canada – 1 ~ 11 Most European Countries – 1 ~ 13 802.11n: USA and Canada – 1 ~ 11 Most European Countries – 1 ~ 13 802.11a:

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<table>
<tr><td></td><td>USA – 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165</td></tr>
<tr><td>Output Power (Board Level Limit)*</td><td>
2.4G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11b (11Mbps) @EVM<35%</td><td>14</td><td>16</td><td>18</td><td>dBm</td></tr>
<tr><td>11g (54Mbps) @EVM≦ -27 dB</td><td>12</td><td>14</td><td>16</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7) @EVM≦ -28 dB</td><td>11</td><td>13</td><td>15</td><td>dBm</td></tr>
<tr><td>11n (HT40 MCS7) @EVM≦ -28 dB</td><td>10</td><td>12</td><td>14</td><td>dBm</td></tr>
</table>
5G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11a (54Mbps) @EVM≦ -27 dB</td><td>11</td><td>13</td><td>15</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7) @EVM≦ -28 dB</td><td>8</td><td>10</td><td>12</td><td>dBm</td></tr>
<tr><td>11n (HT40 MCS7) @EVM≦ -28 dB</td><td>8</td><td>10</td><td>12</td><td>dBm</td></tr>
<tr><td>11ac (VHT20 MCS8) @EVM≦ -30 dB</td><td>8</td><td>10</td><td>12</td><td>dBm</td></tr>
<tr><td>11ac (VHT40 MCS9) @EVM≦ -32 dB</td><td>7</td><td>9</td><td>11</td><td>dBm</td></tr>
<tr><td>11ac (VHT80 MCS9) @EVM≦ -32 dB</td><td>6</td><td>8</td><td>10</td><td>dBm</td></tr>
</table>
</td></tr>
<tr><td>Receiver Sensitivity</td><td>
2.4G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11b (11Mbps)</td><td></td><td>-87</td><td>-84</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)</td><td></td><td>-73</td><td>-70</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td></td><td>-69</td><td>-66</td><td>dBm</td></tr>
<tr><td>11n (HT40 MCS7)</td><td></td><td>-67</td><td>-64</td><td>dBm</td></tr>
</table>
5G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11a (54Mbps)</td><td></td><td>-71</td><td>-68</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td></td><td>-67</td><td>-64</td><td>dBm</td></tr>
<tr><td>11n (HT40 MCS7)</td><td></td><td>-63</td><td>-60</td><td>dBm</td></tr>
<tr><td>11ac (VHT20 MCS8)</td><td></td><td>-67</td><td>-64</td><td>dBm</td></tr>
<tr><td>11ac (VHT40 MCS9)</td><td></td><td>-59</td><td>-56</td><td>dBm</td></tr>
<tr><td>11ac (VHT80 MCS9)</td><td></td><td>-55</td><td>-52</td><td>dBm</td></tr>
</table>
</td></tr>
<tr><td>Data Rate</td><td>WLAN:
802.11b : 1, 2, 5.5, 11Mbps
802.11a/g : 6, 9, 12, 18, 24, 36, 48, 54Mbps</td></tr>
</table>

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	802.11ac/n : Maximum data rates up to 86.7 Mbps(20MHz channel),200 Mbps (40 MHz channel), 433 Mbps (80 MHz channel)
Security	● WPA/WPA2 and WEP 64-bit and 128-bit encryption ● Advanced Encryption Standard (AES)/Counter Mode CBC-MAC Protocol (CCMP) ● AES/Galois/Counter Mode Protocol (GCMP) ● Wired Equivalent Privacy (WEP) /Temporal Key Integrity Protocol (TKIP) ● Advanced Encryption Standard (AES)/Cipher-Based Message Authentication Code (CMAC) ● WLAN Authentication and Privacy Infrastructure (WAPI)

* If you have any certification questions about output power please contact FAE directly.

1.3.3 Bluetooth

<table>
<tr><th>Features</th><th>Description</th></tr>
<tr><td>Bluetooth Standard</td><td>BT4.2+Enhanced Data Rate (EDR)
Bluetooth 5 support</td></tr>
<tr><td>Bluetooth VID/PID</td><td>N/A</td></tr>
<tr><td>Frequency Rage</td><td>2402MHz~2483MHz</td></tr>
<tr><td>Modulation</td><td>Header GFSK
Payload 2M: π/4-DQPSK
Payload 3M: 8DPSK</td></tr>
<tr><td>Output Power</td><td>
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>BDR</td><td>0</td><td>2</td><td>4</td><td>dBm</td></tr>
<tr><td>EDR</td><td>-4</td><td>-1</td><td>1</td><td>dBm</td></tr>
<tr><td>Low Energy</td><td>0</td><td>2</td><td>4</td><td>dBm</td></tr>
</table>
</td></tr>
<tr><td>Receiver Sensitivity</td><td>BT Sensitivity (BER<0.1%)
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>GFSK</td><td></td><td>-88</td><td>-86</td><td>dBm</td></tr>
<tr><td>π/4-DQPSK</td><td></td><td>-88</td><td>-86</td><td>dBm</td></tr>
<tr><td>8DPSK</td><td></td><td>-80</td><td>-78</td><td>dBm</td></tr>
</table>
</td></tr>
</table>

1.3.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	VBAT: 3.07~3.53 VIO : 1.8

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Operating Temperature	-30 °C to +85 °C
Operating Humidity	Less than 85%R.H.
Storage Temperature	-40 °C to +90 °C
Storage Humidity	Less than 60%R.H.
ESD Protection	
Human Body Model	±2KV per MIL-STD-883H Method 3015.8
Changed Device Model	±500V per JEDEC EIA/JESD22-C101E

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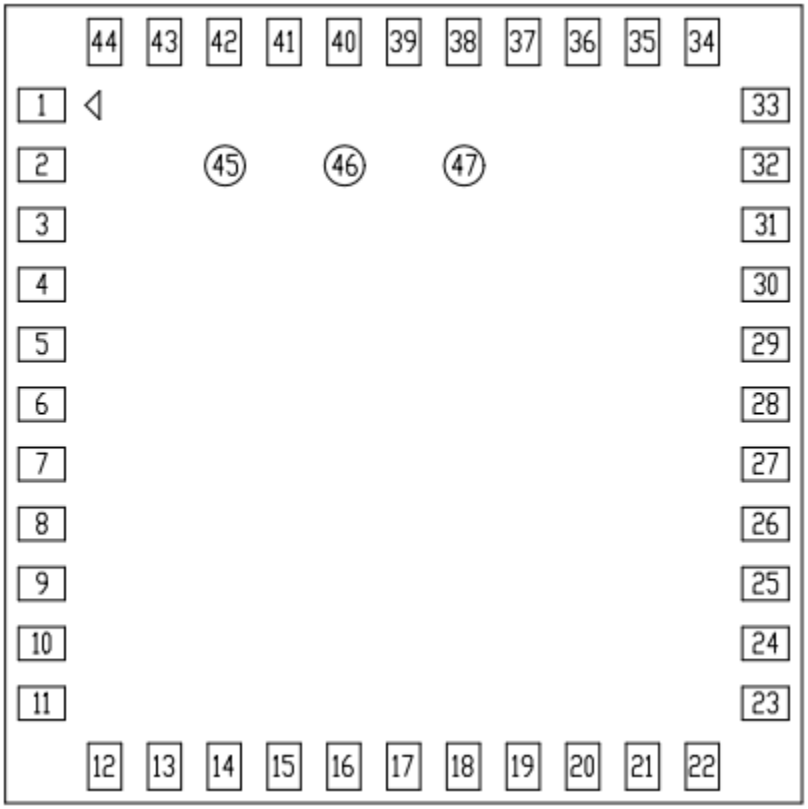
2. Pin Definition

2.1 Pin Map



AW-CM358 Top View Pin Map

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2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	GND	Ground.		GND
2	WL_BT_ANT	WLAN/BT RF TX/RX path.		RF
3	GND	Ground.		GND
4	NC	Floating Pin, No connect to anything.		Floating
5	NC	Floating Pin, No connect to anything.		Floating
6	HOST_WAKE_BT	Host wake-up Bluetooth device		I
7	BT_WAKE_HOST	Bluetooth device to wake-up Host		O
8	NC	Floating Pin, No connect to anything.		Floating
9	VBAT	3.3V power pin	3.3V	VCC
10	NC	Floating Pin, No connect to anything.		Floating
11	NC	Floating Pin, No connect to anything.		Floating
12	PDn	Power up/ down internal regulators. 0 = full power-down mode 1 = normal mode Default pull high in module internal		I
13	WL_HOST_WAKE	WLAN to wake-up HOST		O
14	SDIO_DATA2	SDIO Data Line 2		I/O
15	SDIO_DATA3	SDIO Data Line 3		I/O
16	SDIO_CMD	SDIO Command Input		I/O
17	SDIO_CLK	SDIO Clock Input		I
18	SDIO_DATA0	SDIO Data Line 0		I/O
19	SDIO_DATA1	SDIO Data Line 1		I/O
20	GND	Ground.		GND
21	VIN_LDO_OUT	Switch Node of Internal DC-DC convertor	1.8V	VCC
22	VDDIO	1.8V VDDIO supply for WLAN and Bluetooth	1.8V	VCC

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23	VIN_LDO	DC-DC convertor to supply AVDD18 of IC	1.8V	VCC
24	SUSCLK_IN	External 32K or RTC clock		I
25	BT_PCM_OUT	PCM data out		O
26	BT_PCM_CLK	PCM Clock		I/O
27	BT_PCM_IN	PCM data Input		I
28	BT_PCM_SYNC	PCM Synchronization control		O
29	NC	Floating Pin, No connect to anything.		Floating
30	NC	Floating Pin, No connect to anything.		Floating
31	GND	Ground.		GND
32	NC	Floating Pin, No connect to anything.		Floating
33	GND	Ground.		GND
34	NC	Floating Pin, No connect to anything.		Floating
35	NC	Floating Pin, No connect to anything.		Floating
36	GND	Ground.		GND
37	NC	Floating Pin, No connect to anything.		Floating
38	NC	Floating Pin, No connect to anything.		Floating
39	HOST_WL_WAKE	Host wake-up WLAN device		Floating
40	NC	Floating Pin, No connect to anything.		Floating
41	UART_RTS_N	High-Speed UART RTS		O
42	UART_TXD	High-Speed UART Data Out		O
43	UART_RXD	High-Speed UART Data In		I
44	UART_CTS_N	High-Speed UART CTS		I
45	TP1 (NC)	Floating Pin, No connect to anything.		Floating
46	TP2 (NC)	Floating Pin, No connect to anything.		Floating
47	TP3 (NC)	Floating Pin, No connect to anything.		Floating

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3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VDD33	DC supply for the 3.3V input	2.5	3.3	4.0	V
VDDIO	DC supply voltage for digital I/O		1.8	2.2	V

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VDD33	DC supply for the 3.3V input	3.07	3.3	3.53	V
VDDIO	DC supply voltage for digital I/O	1.67	1.8	1.98	V

3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
Digital I/O pins, VDDIO=1.8V					
V_{IH}	Input high voltage	1.26	-	2.2	V
V_{IL}	Input low voltage	-0.4	-	0.54	V
V_{OH}	Output High Voltage	1.4	-	-	V
V_{OL}	Output Low Voltage	-	-	0.4	V

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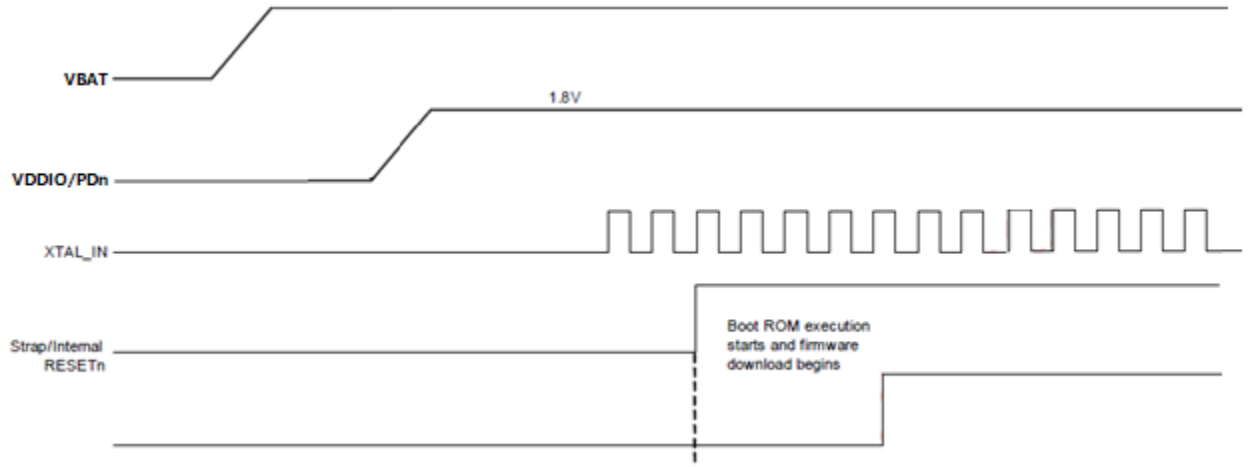
3.4 Power up Timing Sequence

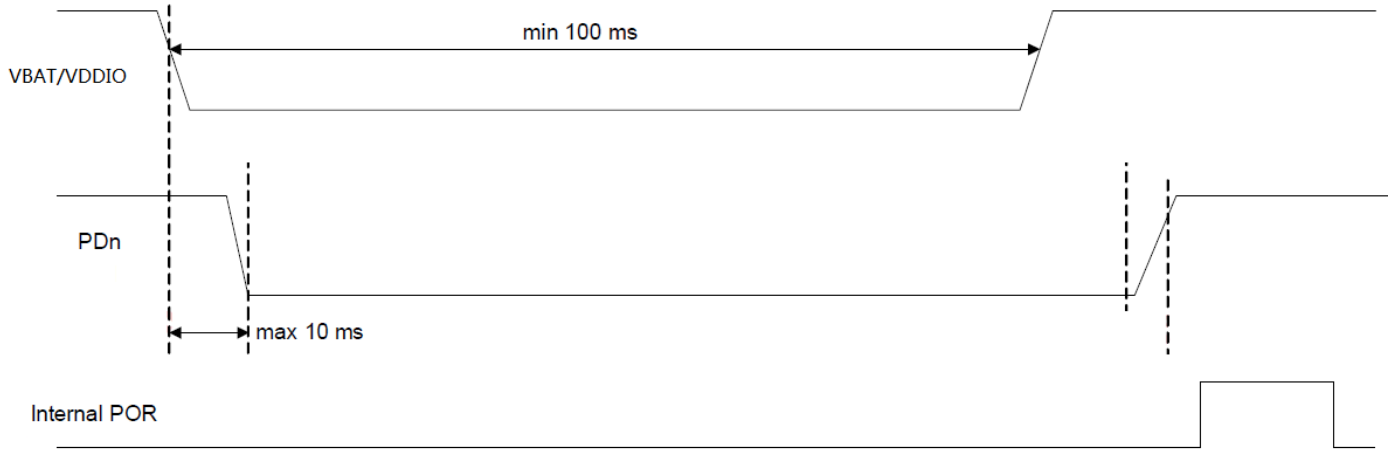
Power-up Sequence

VDDIO/Pdn no specific time requirement, just need to follow up the power on sequence waveform.



Power-down Sequence

The table is AW-CM358 module power down sequence, the maximum ramp-down time for PDn from VBAT assertion is 10ms.VBAT must be asserted a minimum of 100 ms to guarantee that PDn are discharged to less than 0.2V for the POR generate properly after VBAT is deasserted.



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3.4.1 SDIO Host Interface Specification

The AW-CM358 supports a SDIO device interface that conforms to the industry SDIO Full-Speed card specification and allows a host controller using the SDIO bus protocol to access the Wireless SoC device.

The AW-CM358 acts as the device on the SDIO bus. The host unit can access registers of the SDIO interface directly and can access shared memory in the frvice through the use of BARs and a DMA engine.

- Support SDIO 3.0 Standard.
- On-chip memory used for CIS.
- Supports 4-bit SDIO and 1-bit SDIO transfer modes.
- Special interrupt register for information exchange.

SDIO Interface Signals

AW-CM358 SDIO Pin Name	Type	Description
SDIO_DATA_CLK	I	SDIO 4-bit mode: Clock SDIO 1-bit mode: Clock
SDIO_DATA_CMD	I/O	SDIO 4-bit mode: Command line SDIO 1-bit mode: Command line
SDIO_DATA_3	I/O	SDIO 4-bit mode: Data line Bit[3] SDIO 1-bit mode: Not used
SDIO_DATA_2	I/O	SDIO 4-bit mode: Data line Bit[2] or Read Wait (optional) SDIO 1-bit mode: Read Wait (optional)
SDIO_DATA_1	I/O	SDIO 4-bit mode: Data line Bit[1] SDIO 1-bit mode: Interrupt
SDIO_DATA_0	I/O	SDIO 4-bit mode: Data line Bit[0] SDIO 1-bit mode: Data line

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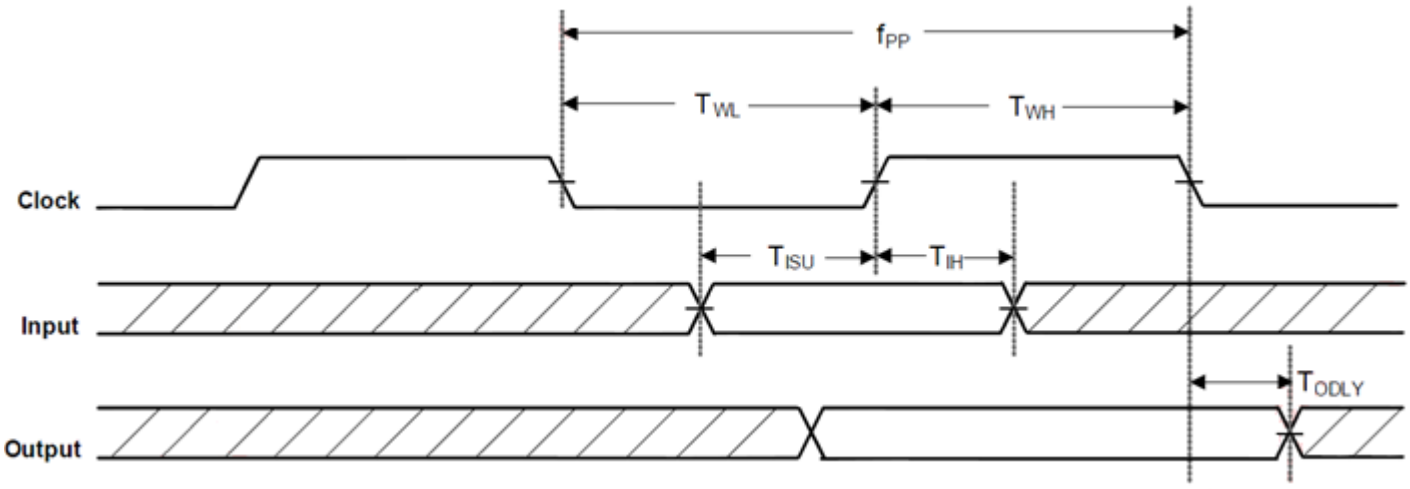
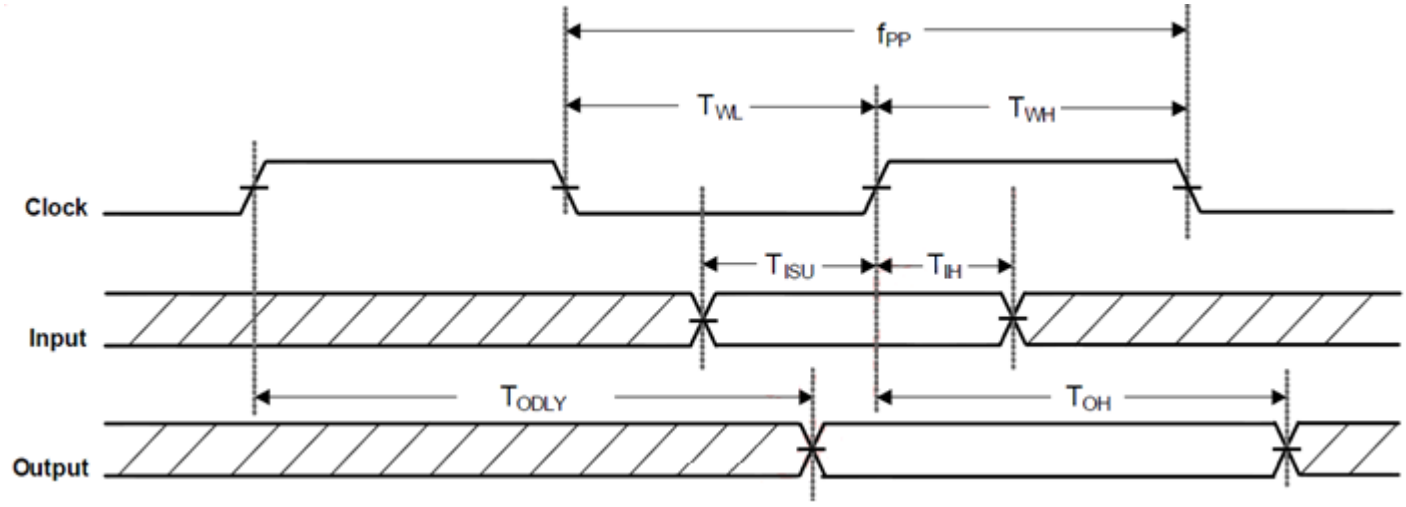
Default Speed, High-Speed Modes

SDIO Protocol Timing Diagram – Default Speed Mode



SDIO Protocol Timing Diagram – High Speed Mode



SDIO Timing Data- Default Speed, High-Speed Modes

Symbol	Parameter	Condition	Min	Max	Units
f_{pp}	CLK Frequency	Normal	0	25	MHz
		High Speed	0	50	
t_{WL}	CLK low Time	Normal	10	-	ns
		High Speed	7	-	
t_{WH}	CLK High Time	Normal	10	-	
		High Speed	7	-	

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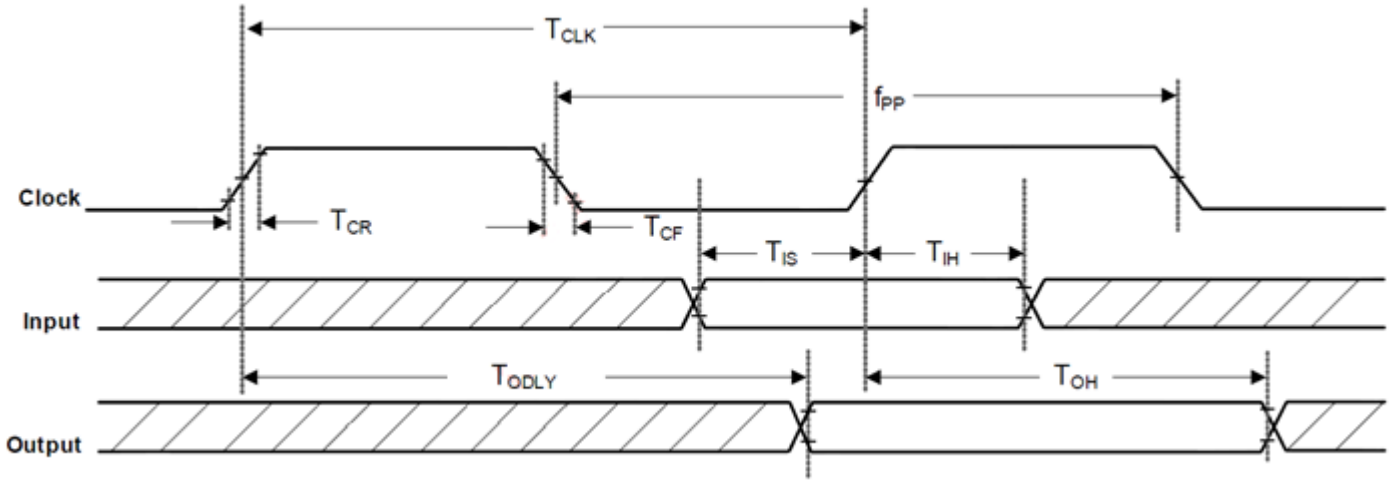
t_{ISU}	Input Setup Time	Normal	5	-	
		High Speed	6	-	
t_{IH}	Input Hold Time	Normal	5	-	
		High Speed	2	-	
t_{ODLY}	Output Delay Time	Normal	-	14	
		High Speed	-	14	
T_{OH}	Output hold time	High Speed	2.5		

1. For SDIO 2.0 running at 50MHz clock frequency, only 1.8V is supported.
2. For SDIO 2.0 running at 25MHz clock frequency, 1.8V is supported.

SDIO Protocol Timing Diagram – SDR12, SDR25, SDR50 Modes (up to 100MHz) (1.8V)



SDIO Timing Data- SDR12, SDR25, SDR50 Modes (up to 100MHz) (1.8V)

Symbol	Parameter	Condition	Min	Typ	Max	Units
f_{pp}	CLK Frequency	SDR12/25/50	25	-	100	MHz
T_{IS}	Input setup time	SDR12/25/50	3	-	-	ns
T_{IH}	Input hold time	SDR12/25/50	0.8	-	-	ns
T_{CLK}	Clock time	SDR12/25/50	10	-	40	ns
T_{CR}, T_{CF}	Rise time, fall time	SDR12/25/50	-	-	0.2*T_{CLK}	ns
T_{ODLY}	Output delay time	SDR12/25/50	-	-	7.5	ns
T_{OH}	Output hold time	SDR12/25/50	1.5	-	-	ns

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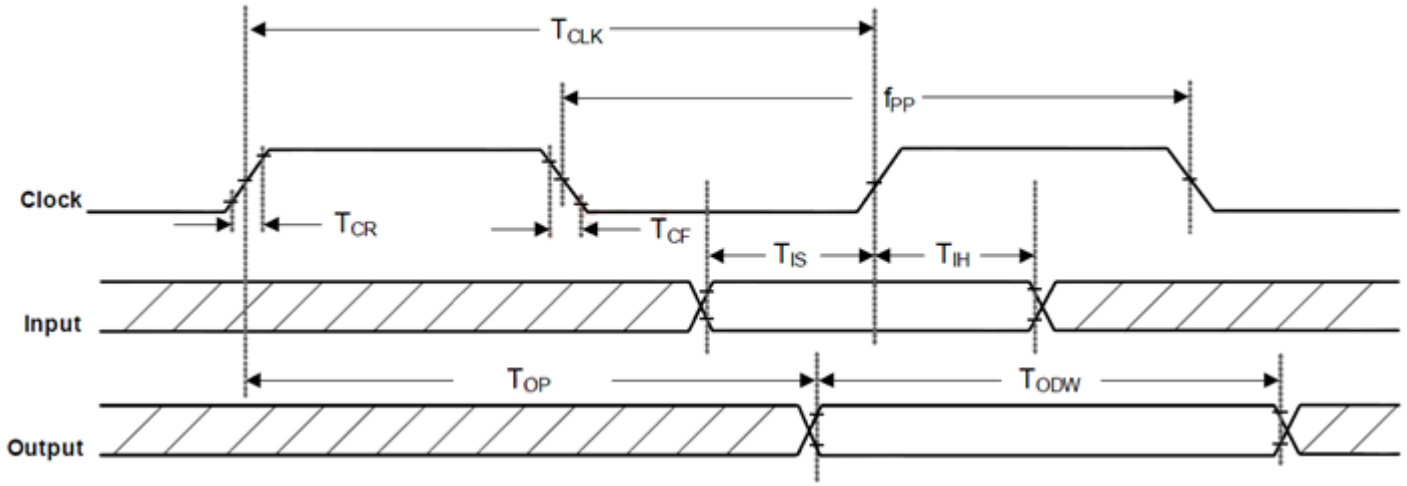
SDIO Protocol Timing Diagram – SDR104 Mode (208MHz)



SDIO Timing Data- SDR104 Mode (208MHz)

Symbol	Parameter	Condition	Min	Typ	Max	Units
f_{pp}	CLK Frequency	SDR104	0	-	208	MHz
T_{IS}	Input setup time	SDR104	1.4	-	-	ns
T_{IH}	Input hold time	SDR104	0.8	-	-	ns
T_{CLK}	Clock time	SDR104	4.8	-		ns
T_{CR}, T_{CF}	Rise time, fall time	SDR104	-	-	0.2*T_{CLK}	ns
T_{ODLY}	Output delay time	SDR104	0	-	10	ns
T_{OH}	Output hold time	SDR104	2.88	-	-	ns

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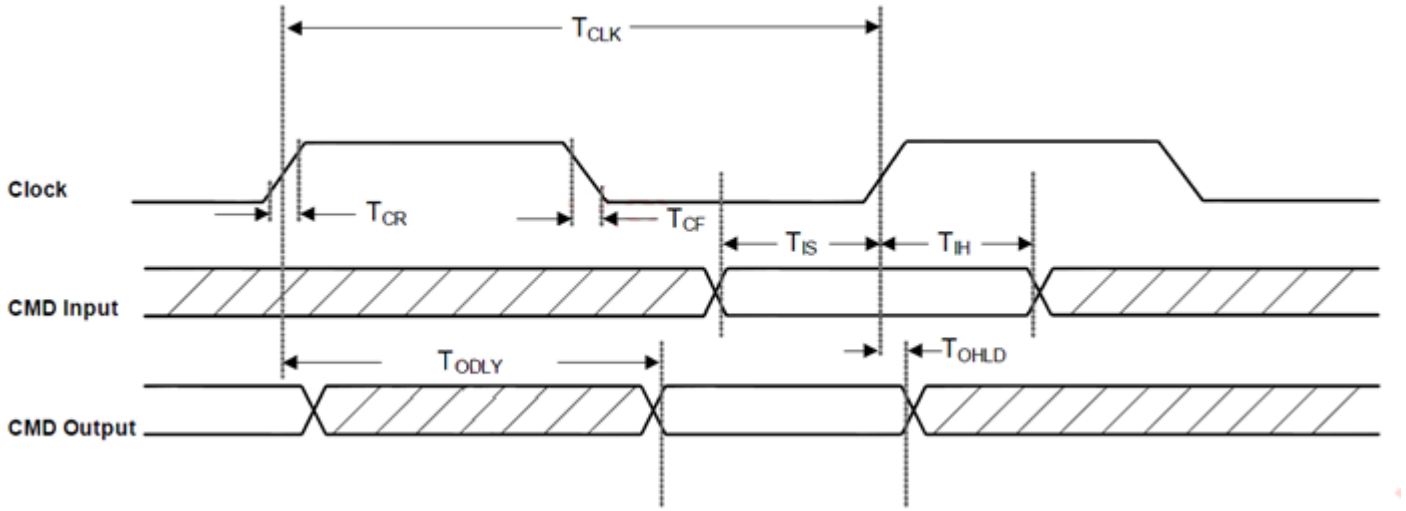
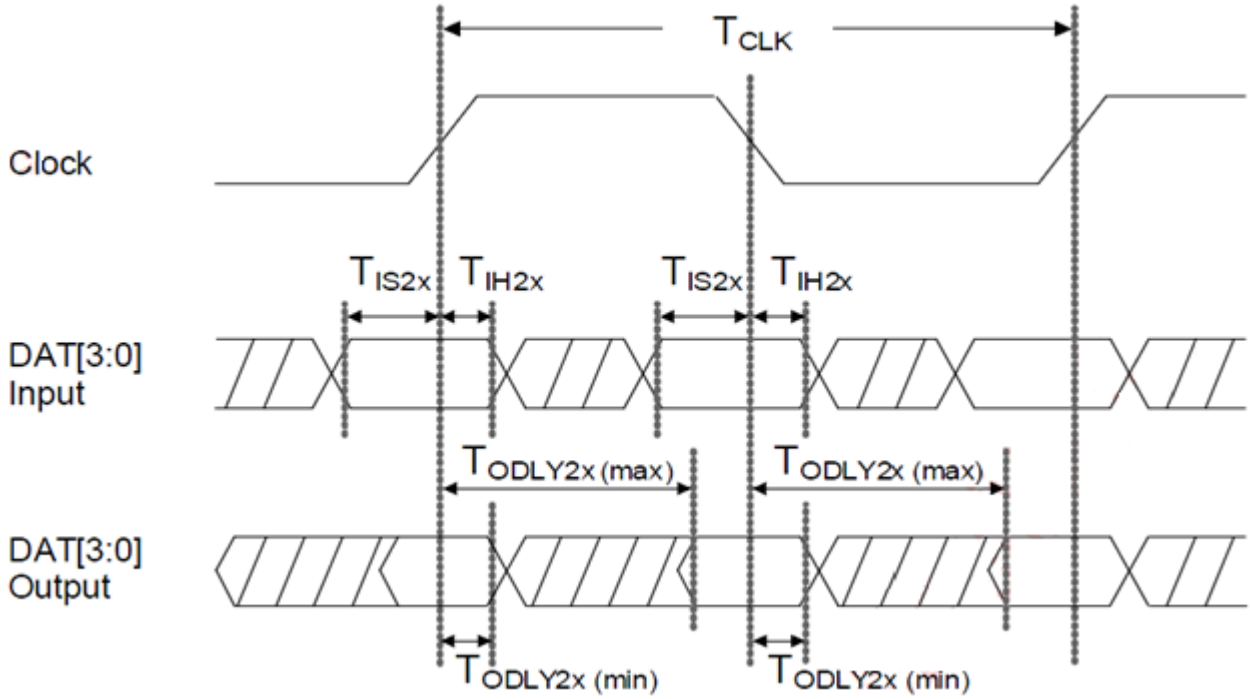
SDIO CMD Timing Diagram – DDR50 Mode (50MHz)



SDIO SAT [3:0] Timing Diagram – SDR50 Mode (50MHz)



SDIO Timing Data- DDR50 Mode (50MHz)

Symbol	Parameter	Condition	Min	Typ	Max	Units
Clock						
T_{CLK}	Clock time	DDR50	20	-	-	ns
T_{CR}, T_{CF}	Rise time, fall time	DDR50	-	-	0.2*T_{CLK}	Ns

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Clock Duty		DDR50	45	-	55	%
CMD Input						
T_{IS}	Input setup time	DDR50	6	-	-	ns
T_{IH}	Input hold time	DDR50	0.8	-	-	ns
CMD Output						
T_{ODLY}	Output delay time during data transfer mode	DDR50	-	-	13.7	ns
T_{OHLD}	Output hold time	DDR50	1.5	-	-	ns
DAT [3:0] Input						
T_{IS2X}	Input hold time	DDR50	3	-	-	ns
T_{IH2X}	Input hold time	DDR50	0.8	-	-	ns
DAT [3:0] Output						
$T_{ODLY2X(max)}$	Output delay time during data transfer mode	DDR50	-	-	7	ns
$T_{ODLY2X(min)}$	Output hold time	DDR50	1.5	-	-	ns

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3.4.2 UART Interface

High-Speed UART interface

The AW-CM358 supports a high-speed Universal Asynchronous Receiver/ Transmitter (UART) interface, compliant to the industry standard 16550 specification.

- FIFO mode permanently selected for transmit and receive operations.
- 2 pins for transmit and receive operations.
- 2 flow control pins.
- Interrupt triggers for low-power, internal CPU (for debug purposes).
- Support diagnostic tests.
- Support data input/ output operations for peripheral devices connected through a standard UART interface.

UART Interface Signals

Pin Number	Signal Name	16550 Standard Name	Type	Description
42	UART_SOUT	SOUT	O	Serial data
43	UART_SIN	SIN	I	Serial data
44	UART_CTSn	CTSn	I	Clear To Send
41	UART_RTSn	RTSn	O	Request To Send

UART Baud Rates Supported

Baud Rate				
1200	38400	460800	1500000	3000000
2400	57600	500000	1843200	3250000
4800	76800	921600	2000000	3692300
9600	115200	1000000	2100000	4000000
19200	230400	1382400	2764800	-

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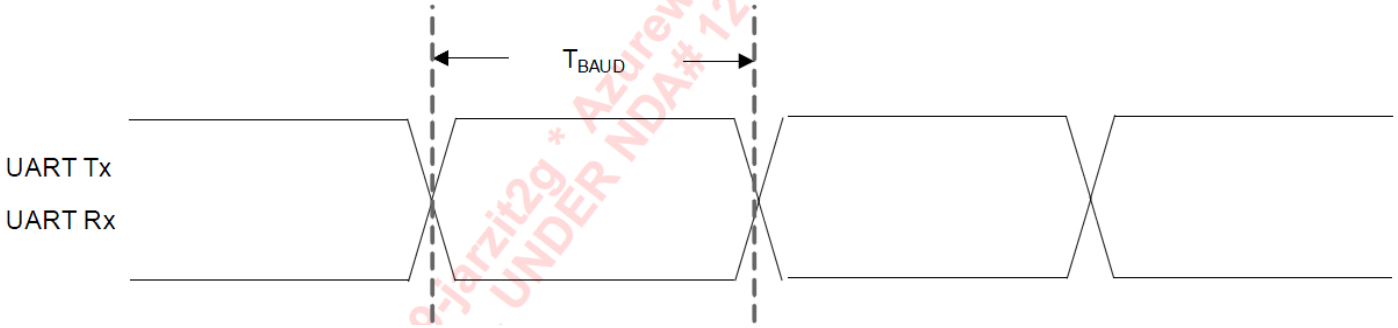
The UART Tx and Rx pins are powered from the VDDIO voltage supply.

UART Timing Diagram



UART Timing Data

Symbol	Parameter	Condition	Min	Typ	Max	Units
TBAUD	Baud rate	26MHz input clock	250	-	-	ns
TBAUD	Baud rate	38.4MHz input clock	250	-	-	ns

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3.4.3 Frequency Reference

An external crystal is used for generating all radio frequencies and normal operation clocking. As an alternative, an external frequency reference driven by a temperature-compensated crystal oscillator (TCXO) signal may be used. No software settings are required to differentiate between the two. In addition, a low-power oscillator (LPO) is provided for lower power mode timing.

External 32.768KHz Low-Power Oscillator

Symbol	Parameter	Min	Typ	Max	Units
CLK	Clock frequency range/ accuracy CMOS input clock signal type ±250 ppm (initial, aging, temperature)	-	32.768	-	kHz
V_{IH}	Input levels, where VDDIO=1.8, 3.3V for VIH, VIL	0.7*VDDIO	-	VDDIO_0.4	V
V_{IL}		-0.4	-	0.3*VDDIO	V
PN	Phase noise requirement (@ 100KHz)	-	-125	-	dBc/Hz
J_C	Cycle jitter	-	1.5	-	ns (RMS)
SR	Slew rate limit (10-90%)	-	-	100	ns
DC	Duty cycle tolerance	20	-	80	%

The AW-CM358 module crystal specifications

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3.5 Power Consumption*

3.5.1 WLAN

No.	Item			VBAT_IN=3.3 V		
				Max.	Avg.	
1	Power Down*(1)(2)			1.0mA	0.92mA	
2	Sleep *(2)(4) (Not associated with AP)			1.3mA	1.2mA	
3	Power Save (2.4GHz)*(2) (3)(4)			49.5mA	2.4mA	
4	Power Save (5GHz)*(2) (3)(4)			80.4mA	2.1mA	
Band (GHz)	**Mode**	**BW (MHz)**	**RF Power (dBm)**	**Transmit**		
				Max.	**Avg.**	**Duty(%) (Mean)**
2.4	11b@1Mbps	20	16	287	161	67
	11b@11Mbps	20	16	277	163	65
	11g@54Mbps	20	14	191	120	52
	11n@MCS7	40	12	98	57	36
5	11a@6Mbps	20	13	247	143	64
	11a@54Mbps	20	13	198	130	53
	11n@MCS7	40	10	112	74	16
	11ac@MCS0	20	10	217	129	48
	11ac@MCS9	40	9	103	74	42
	11ac@MCS0 NSS1	80	8	212	88	55
	11ac@MCS9 NSS1	80	8	93	76	27
Band (GHz)	**Mode**	**BW(MHz)**		**Receive**		
				Max.	**Avg.**	
2.4	11b@1Mbps	20		57	55	
	11n@MCS7	40		64	63	
5	11a@6Mbps	20		71	69	
	11ac@MCS8 NSS1	20		73	72	
	11ac@MCS9 NSS1	40		85	84	
	11ac@MCS9 NSS1	80		98	95	

***Current Unit: mA**

* The power consumption is based on Azurewave test environment, these data for reference only.

(1) WLAN and Bluetooth off (WL_REG_ON=LOW, #hciconfig hciX down)
(2) Using normal firmware.
(3) Link AP use ASUS RT-AC66U, DTIM = 1, Beacon Interval = 100 ms
(4) WLAN Initial value is too high, in SD-UART mode, BT power save mode is Active, About this issue, Please refer below bring up commend:

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modprobe cfg80211
insmod mlan.ko
insmod sd8987.ko cal_data_cfg=none fw_name=mrvl/sdio8xxx_uart_combo_pxx.bin
insmod hci_uart.ko ps_mode=1
hciattach /dev/ttyUSB0 any 115200 flow

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3.5.2 Bluetooth

No.	Mode	Packet Type	RF Power (dBm)	VBAT_IN=3.3 V	
				Max.	Avg.
1	Play Music*(1)	A2DP	n/a	21.6	12
2	Transmit*(2)	DH5	4	68.9	62.8
3	Receive*(2)	3-DH5	n/a	61.4	57.3

***Current Unit: mA**

* The power consumption is based on Azurewave test environment, these data for reference only.

1. Using Normal Firmware
2. Using MFG Firmware

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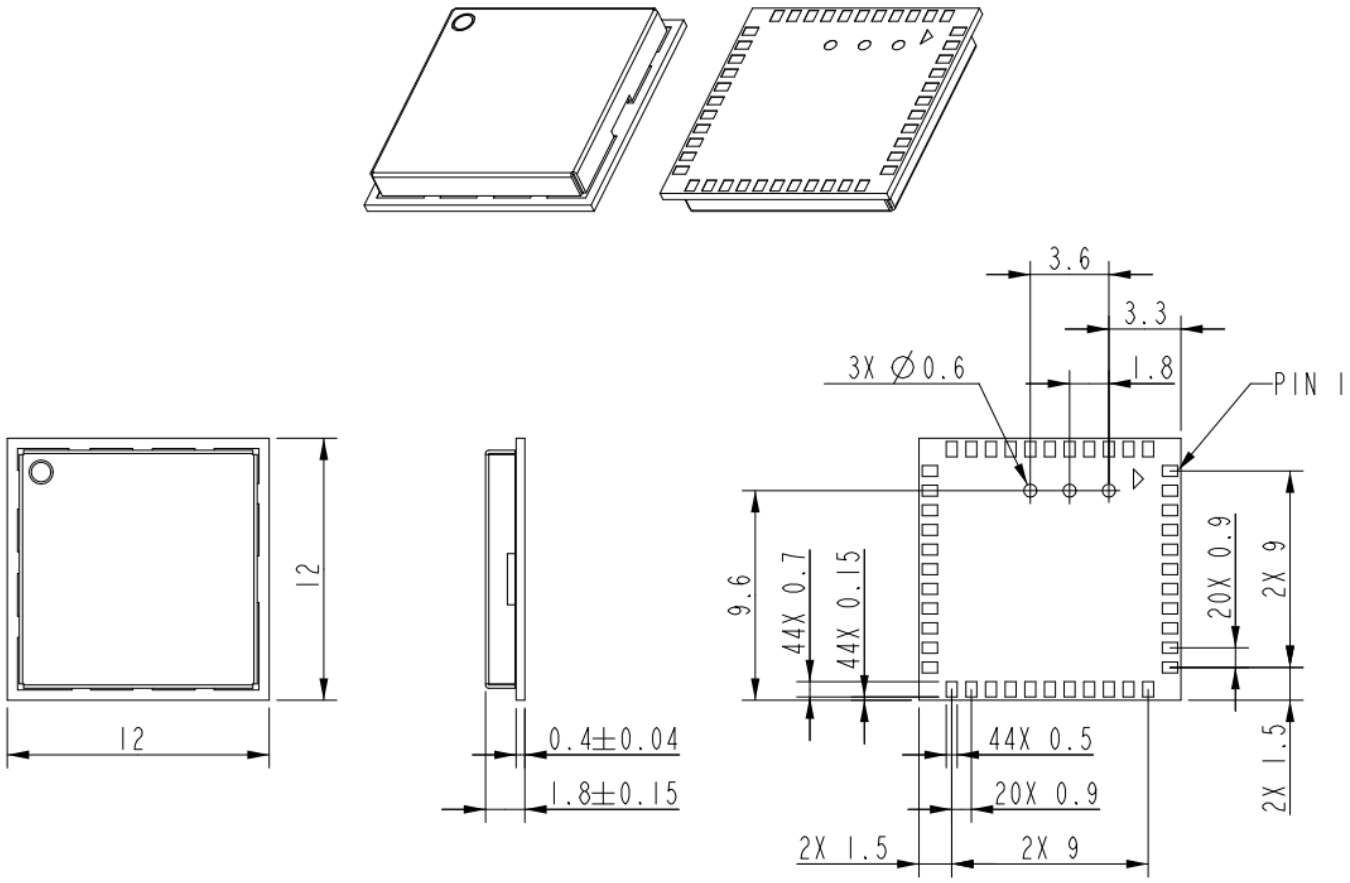
4. Mechanical Information

4.1 Mechanical Drawing



TOLERANCE UNLESS OTHERWISE SPECIFIED:±0.1mm

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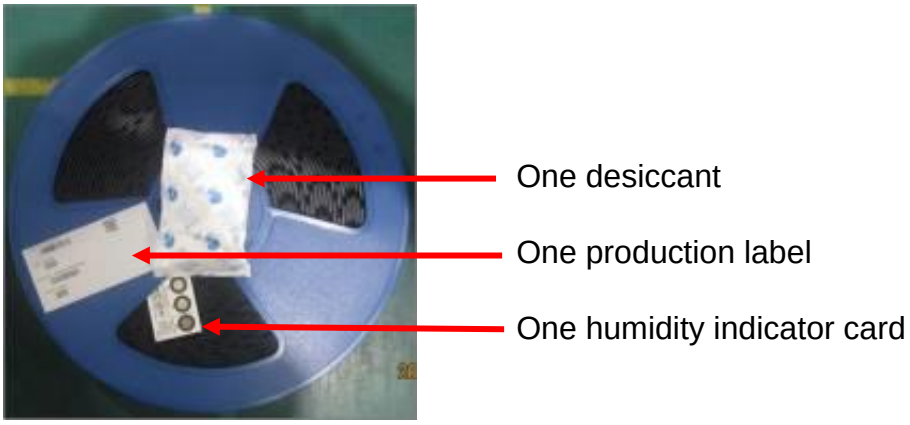
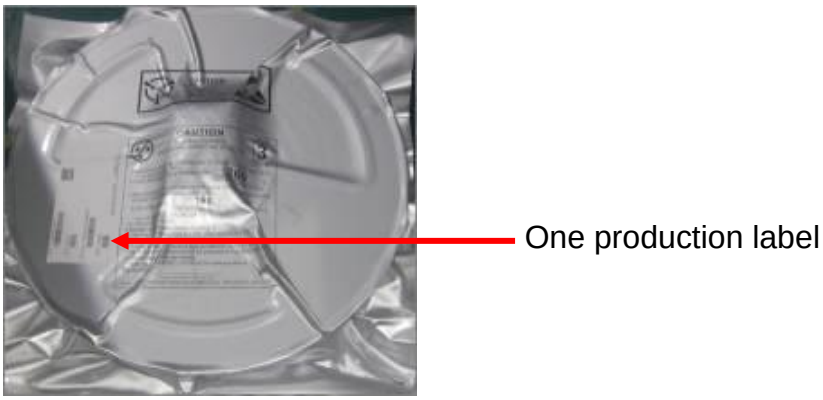
5. Packaging Information

1. One reel can pack 1,500pcs 12x12 LGA modules
   (整軸產品數量為 1500pcs)

2. One production label is pasted on the reel, one desiccant and one humidity indicator card are put on the reel
   (卷軸貼上一張生產標籤，並放上一包防潮包及濕度指示卡)



3. One reel is put into the anti-static moisture barrier bag, and then one label is pasted on the bag
   (卷軸放進防靜電鋁箔袋，再貼上一張生產標籤)



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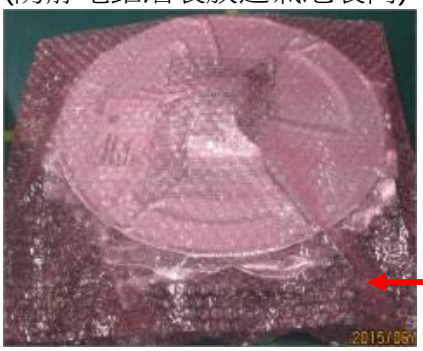
4. A bag is put into the anti-static pink bubble wrap
   (防靜電鋁箔袋放進氣泡袋內)



One anti-static pink bubble wrap

5. A bubble wrap is put into the inner box and then one label is pasted on the inner box
   (氣泡袋放進內箱中，再貼上一張生產標籤)

One production label

6. **5 inner boxes** could be put into one carton
   (五個內箱可以放進一個外箱)

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7. Sealing the carton by AzureWave tape

   (使用海華 Logo 膠帶將外箱進行工字型封箱)

8. One carton label and one box label are pasted on the carton. If one carton is not full, one balance label pasted on the carton

   (外箱上貼附出貨標籤和箱號標籤；如不滿箱，需貼附尾數標籤)

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